REMARKS

Claim Objections

Claims 1-28 are objected to because of the use of the term "Eularian." Appropriate correction has been made to claims 1, 4, 6-7, 9-10, 12, 14-16, 18-19, 22-26 and 28. Claims 2-3, 5, 8, 11, 13, 17, 20-21 and 27 do not contain the term "Eularian," thus no correction is needed.

Claim Rejections – 35 U.S.C. §101

Claims 22-24 are rejected because the claimed invention is directed to non-statutory subject matter.

The Examiner has rejected these claims on the basis that "the claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer which permit the computer program's functionality to be realized."

Claims 22-24 recite a data signal. The data signal contains instructions that produce a useful, non-abstract result. Such a data signal is statutory subject matter and is well understood in the art to have a functional relationship with various hardware components of an electronic device. See e.g. AT&T v. Excel, 172 F.3d 1352 (Fed. Cir. 1999). Furthermore, those of skill in the art understand that a computer program is executed by a microprocessor, and it is not necessary to recite such well understood things in a patent claim. Therefore, it is kindly asserted that claims 22-24 are eligible subject matter under 35 USC § 101.

Claim Rejections – 35 U.S.C. §112

As an initial matter, it is respectfully submitted that all of the pending claims fulfill the requirement of 35 U.S.C. § 112. The claims are fully enabled and sufficiently definite for the reasons set forth below.

In satisfying the enablement requirement, an application need not teach, and preferably omits, that which is well-known in the art. Hybritech, Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367 (Fed. Cir. 1986); Lindemann Maschinenfabrik GMBH v. American Hoist and Derrick Co., 730 F.2d 1452, 1463 (Fed. Cir. 1984). How such a teaching is set forth, whether by the use

of illustrative examples or by broad descriptive terminology, is of no importance since a specification which teaches how to make and use the invention in terms which correspond in scope to the claims must be taken as complying with the first paragraph of 35 USC 112 unless there is reason to doubt the objective truth of the statements relied upon therein for enabling support. Marzocchi at 439 F.2d 223.

Finite element analysis is a highly technical subject matter that is the subject of text books and university courses. Much of it is well known, and to teach all of the well known aspects of finite element analysis would transform the present patent application from a concise document into a tome, contrary to the well accepted approach prescribed by Hybritech and numerous other authority. The present application, in the Background of the Invention section, page 1, line 25, refers to the reader to "The Finite Element Method" by Thomas J.R. Hughes for further information. The Hughes reference was incorporated by reference in its entirety.

"The test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification... If the claims read in light of specification reasonably apprise those skilled in the art of the scope of the invention, §112 demands no more." See e.g. Miles Laboratories, Inc. v. Shandon Inc., 5 F.3d 1464 (Fed. Cir. 1993).

One skilled in the art of modern finite element analysis would have no problem practicing the invention or understanding the bounds of any of the pending claims when read in the light of the specification, as explained below.

The following paragraphs address the Examiner's specific concerns.

Claim 3 was rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the enablement requirement. The Examiner has asserted that the term "fill fraction" was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the fill fraction..."

The term "fill fraction" as used in the claims and the specification has its ordinary meaning and should be understood by both those skilled in the art and by laypersons. For instance, a glass of water that is half filled has a fill fraction of 0.5, and a circle that is completely filled with cross hatching or another pattern would have a fill fraction of 1.0. Contrary to the Examiner's assertions, one of skill in the art would also know how to make or use the invention reciting the "fill fraction" limitation in dependent claim 3.

Therefore, it is kindly asserted that claim 3 is fully enabled and in condition for allowance.

Claims 1-9, 11-17, 18-21 and 25-28 were rejected under 35 U.S.C. § 112, second paragraph for different reasons. It is respectfully submitted that all of these claims satisfy the criteria of 35 U.S.C. § 112, second paragraph and are in condition for allowance for the following reasons.

Claims 12-17, 18-21 and 25-28 were rejected under 35 U.S.C. § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner has stated that "the term 'automatically switching' is unclear if the automatic feature is a result of a computer step or if it is a result of some manual input that activates the switching." As taught in the specification on page 11, lines 1-3, "[w]hen the user sets up the simulation, he will decide at which point in time he wishes to conclude the Eulerian portion of the simulation. Alternatively this may be preset in the software for certain simulations." Therefore, while the user may provide some input (when the simulation is configured) that impacts when the switch may take place, the switching during the simulation happens "automatically" as a result of instructions in the software. In the preferred embodiments described, the "automatic switching" process is initiated (along with other processes) after reaching time t_{max}. See FIG. 5.

Claims 1-8, and 11 were rejected under 35 U.S.C. § 112, second paragraph as being incomplete for omitting essential steps/elements. It is respectfully asserted that nothing essential is missing from the claims, and that one of skill in the art would easily be able to understand and interpret the claims. The Examiner has recommended that the applicant disclose the procedure involved in projecting. It is kindly submitted that the procedure has already been disclosed in the specification. The projection of nodes is taught to be orthogonal, as stated on page 11, lines 10-12. Orthogonal projection is an established mathematical expression and it is unambiguous. Another term for orthogonal projection is closest point projection.

Claim 2 is rejected under 35 U.S.C. § 112, second paragraph as being incomplete for omitting essential steps/elements regarding deleting empty elements. It is respectfully asserted that nothing essential is missing from the claims, and that one of skill in the art would easily be able to understand and interpret the claims. The Examiner has recommended that the applicant

disclose the procedure involved in deleting empty elements. It is kindly submitted that the procedure has already been disclosed in the specification, as explained below.

During the Eulerian simulation each element in the model contains a certain fill fraction of material, η, ranging between 0 and 1. See page 11. After projecting nodes and remapping the solution, all elements are either completely filled (η=1) or empty (η =0). Those elements that are filled define the discretized geometry in the Lagrangian model. Empty elements are not needed anymore, and hence they are "deleted," as seen in step E8 of FIG. 5 This means that although they were once present as part of the simulation, and therefore in a memory of the computer system, they are not written to the dynain file. See FIG. 5 steps E8-E11 and page 12. The empty cells do not therefore become a part of the Lagrangian model. This deletion would be clear to one of skill in the art reading the description. Furthermore, an example is provided to show the reader what the process appears like when utilized in solving a realistic and relatively uncomplicated problem. As can be seen in the Brief Description of the Drawings and from the Illustrative Example section beginning on page 13, FIG. 11 illustrates the beam of FIGS. 9 and 10a-10c after removing empty cells, according to an embodiment of the invention.

The Examiner has also rejected claim 4 and recommended that the applicant disclose the difference between the explicit integration and the implicit integration and the necessary procedures in order to realize said integrations. Firstly, implicit and explicit integration are well known, and one of skill in the art understands these and other methods of advancing the solution in time. An application need not teach, and preferably omits, that which is well-known in the art. Hybritech. Secondly, a "gap" is not present given that how such integration is carried out is well known. Thirdly, in the method of claim 1, the method for advancing the solution is not limited and any type of well known time integration schemes can be utilized. Dependent claim 4 recites the preferred method of integration for use with the Eulerian and Lagrangian simulations. Furthermore, the Background of the Invention *does* teach explicit and implicit integration from page 3, line 5, to page 4, line 19. The Examiner is kindly referred to said teachings.

Regarding claims 5, 11, and 16 the Examiner has recommended that the applicant disclose the procedure involved in merging nodes. It is well understood in the art how to merge nodes, and that when two or more nodes located very closely to each other are merged to become one single node that the coordinate of that node is the average of the individual nodes before merging. This is basic mathematics. An application need not teach, and preferably omits, that

which is well-known in the art. Hybritech. Thus there is also no "gap" in claims 5, 11, and 16 to one of skill in the art.

Regarding claim 7, the Examiner recommends that the application disclose the procedure involved in converting from Eulerian to Lagrangian simulation. The preferred method of converting is clearly described in the text regarding FIG. 5 and in FIG. 5 itself. While other converting methods may be utilized and are within the scope of the invention, the preferred method of conversion comprises projection of nodes as recited in dependent claim 8, and may also comprise remapping of the solution, deletion of empty elements, merging of nodes and writing to the dynain file (steps E6-E10 in FIG 5). After finishing the Eulerian analysis, the dynain file will contain a complete Lagrangian finite element model that can be used for subsequent analyses (as compared to the Eularian model present at the start).

Regarding claim 9, the Examiner has recommended that the applicant disclose the procedure involved in mapping from an Eulerian element grid onto a Lagrangian grid. There are several well known methods for mapping the solution from one mesh onto another. Such methods need not be taught in the present application according to Hybritech. The methods employed by the preferred embodiment are referred to as the Donor Cell and Van Leer schemes, as seen on page 12, lines 6-7 of the present application. Both methods are described in a comprehensive article by D.J. Benson: *David J. Benson, Computational methods in Lagrangian and Eulerian Hydrocodes. Computer Methods in Applied Mechanics and Engineering 99 (1992) 235-394.* Reference to this article can be found at page 12, line 6, of the present application.

Therefore it is respectfully submitted that all pending claims are in full compliance with the requirements of § 112.

Claim Rejections – 35 U.S.C. §102

Claims 1-28 are rejected under 35 U.S.C. § 102(b) as being anticipated by an abstract entitled, "Implicit Springback Calculation Using LSDYNA" by Bradley N. Maker ("Maker").

The Examiner asserts that Maker discloses "performing an Eulerian simulation and switching to a Lagrangian simulation (L11-12)." This is simply not true. Maker does not, either explicitly, or inherently, teach either Eulerian or Lagrangian simulation, let alone "performing an Eulerian simulation and switching to a Lagrangian simulation."

Maker teaches that "[a] new capability has been added to LS-DYNA which allows automatic switching from dynamic explicit to static implicit analysis at the end of a forming simulation." Maker lines 11-12. While it is unclear exactly what of the 12 line paragraph the Examiner is relying on as teaching all of the individual limitations of the 28 claims, because the rejection does not address the claims on a limitation by limitation basis, it appears that the Examiner believes that implicit or explicit integration inherently teaches either Lagrangian or Eulerian finite element formulations. This is not the case. As seen at page 9, line 25 of the present application, "[t]he Eulerian and Lagrangian phase can be implicit or explicit." This is well known in the art. In fact, as stated earlier, other types of integration are also possible with the present invention. Any association between the type of integration employed for each formulation is simply illustrative and offered to aid in understanding the preferred embodiments. As the application states, "[f]or illustrative purposes an explicit Eularian phase and an implicit Lagrangian phase are described." Page 9, line 25 to page 10 line 1. Therefore, the "automatic switching from dynamic explicit to static implicit analysis at the end of a forming simulation" taught by Maker does not inherently or intrinsically teach "performing an Eulerian simulation and switching to a Lagrangian simulation (L11-12)" as asserted by the Examiner. Nor does Maker teach all of the limitations of each of claims 1-28.

It is noted that, for § 112 purposes the Examiner asserts that the pending claims and/or disclosure omit certain things needed to enable and adequately describe the claimed invention, whereas for the purposes of § 102, the Examiner now asserts that a one paragraph abstract inherently teaches each and every limitation of claims 1-28. This logic appears inapposite and is highly objectionable.

Therefore, it is respectfully submitted that pending claims 1-28 are novel in light of Maker and all the cited references and are in condition for allowance.

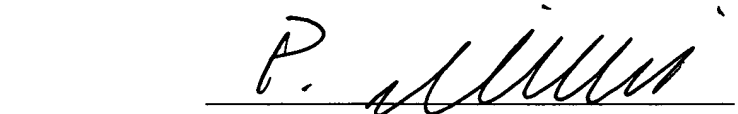
The Examiner is kindly encouraged to call with any questions regarding any aspect of the application or this Response, as this technology is admittedly esoteric.

Conclusion

Accordingly, it is believed that this application is now in condition for allowance and an early indication of its allowance is solicited. However, if the Examiner has any further matters

that need to be resolved, a telephone call to the undersigned attorney at 415-318-1168 would be appreciated.

Respectfully submitted,



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